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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
NGUYEN, CUONG QUANG	
ART UNIT	**PAPER NUMBER**
2811	

DATE MAILED: 01/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/788,815	MA ET AL.	
	Examiner	Art Unit	
	Cuong Q. Nguyen	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-95 is/are pending in the application.

4a) Of the above claim(s) 6,13-23,25-35,37,39-70,72-82 and 84-95 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-5,7-12,24,36,38,71 and 83 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restriction

1. The new limitations such as "a second coupling structure comprising a via reaching from said source runner to said backside metal layer" in claim 42 is not in elected Embodiment of Fig.2 to Fig.3D; the limitations in newly added claims 72-82 and 84-95 are also not in elected Embodiment Fig.2 to Fig.3D. So, claims 6 (depending on claim 41), 42-45, 47, 55, 56, 57, 61, 72-82 and 84-95 have been withdrawn from consideration.

Specification

2. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

The term "comprises" should not be used in the Abstract.

Claim Objections

3. Claim 1 is objected to because of the following informalities: the expression "a barrier layers" should be changed to "a barrier layer". Appropriate correction is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 4, 5, 7, 10, 12, 14 and 71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morikawa et al. (US 6,707,102) in view of Teong (US 5,693,563).

Regarding claims 1, 2, Morikawa et al. discloses A semiconductor device comprising: a semiconductor substrate (1); an insulating layer (11) on top of the substrate; a lateral field effect transistor comprising a drain region (9) and a source region (50 arranged in the substrate and a gate arranged above said substrate within said insulating layer; a drain runner (15) arranged on top of the insulator layer above the drain region; a source runner (*13) arranged on top of the insulator layer above the source region; a gate runner (14) arranged on top of the insulator layer outside an area

defined by the drain runner and the source runner; a first coupling structure comprising a via for coupling the drain runner with the drain region; and a second coupling structure comprising a via for coupling the source runner with the source region. See Morikawa et al.'s Fig.1 and Fig.2.

Morikawa et al. does not teach that metal layers arranged at the bottom of vias of the first and second coupling structures and within the insulating layer, wherein the barrier metal layer comprises a first horizontal bottom layer adjacent the via and a side wall being rectangular to and surrounding the first horizontal bottom layer.

Teong discloses a semiconductor device comprising a barrier metal layer (4) arranged at the bottom of via and within the insulating layer, wherein the barrier metal layer comprises a first horizontal bottom layer adjacent the via and a side wall being rectangular to and surrounding the first horizontal bottom layer. See Fig.5b.

It would have been obvious to one of ordinary skill in the art to incorporate the barrier metal layer as taught by Teong into Morikawa etb al.'s device in order to prevent the diffusion of metal in the via. See Teong's col.2 lines 29-35.

Regarding claims 4, 5 and 7, Teong teaches that the barrier metal layer (4) including a Ti layer and a TiN layer, wherein bottom barrier metal layer of a via and having a cross-sectional profile of a saucer around the via and the bottom metal layers comprises side wall that enclose the via.

Regarding claim 10, as shown in Morikawa et al.'s Fig.2, a sinker structure (6) that reaches from the top to the bottom of the substrate.

Regarding claim 12, as shown in Morikawa et al's Fig.2, a well structure (7) surrounding the source region (5).

Regarding claim 24, Morikawa teaches that the substrate comprises a p+ substrate (1A) and a p- epitaxial layer (1B). Col.5 lines 40-50.

Regarding claim 71, as shown in Teong's Fig.5b, the barrier metal layer further comprises a second horizontal layer within the insulating layer extending from a top end of the side wall in a direction pointing away from the via.

Claims 3 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morikawa et al. in view of Teong and further in view of Huang et al. (US 5,654,589).

Regarding claim 3, Morikawa teaches the source, drain runners and the coupling structures are formed from the same layer. Morikawa does not teach that the runners and the coupling structures are formed by using different layers such that the contact holes are completely embedded with electrical conductive layer.

Huang et al. teaches that forming the electrical conductive layer and the first-layer metal line layer by using two layers such as filling the contact hole the using CMP to be flattened and then forming a second metal layer on the electrical conductive layer. See Huang's Fig.2.

It would have been obvious to one of ordinary skill in the art to form the source/drain runner and the coupling structure by using different layers such that the contact holes are completely embedded with electrical conductive layer as taught by Huang et al. in order to obtain a planar upper surface so that is is easier to form other layers on the planar surface at later steps.

As shown in Huang et al.'s Fig.2, the second metal layer on top of the planar top surface of the via includes a barrier layer (44) (a Ti layer). So the device being formed by the combination of Morikawa et al., Teong and Huang et al. includes barrier layers arranged at the top of via.

Regarding claim 9, Huang teaches that the first metal (40) embedded in the contact hole (via) is formed of tungsten. Col.7 lines 30-35.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Morikawa et al. in view of Teong, Huang et al. and further in view of Callegari et al. (US 6,664,186).

The combination of Morikawa, Teong and Huang teaches all the limitation of claim 3 as shown above but does not teach that the top barrier layer consists of Titanium-platinum.

It is conventional and also taught by Callegari et al. (layer 32 of Fig.27 and column 14 lines 5-15) that TiPt and Ti are art recognized materials for forming barrier layer and they are interchaneable.

It would have been obvious to one of ordinary skill in the art to form the top barrier layer by conventional material TiPt as taught by Callegari et al. instead of Ti.

Claims 11, 36, 38 and 83 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morikawa et al. in view of Teong and further in view of Rumennik (US 6,600,182).

Morikawa et al. and Teong teaches all the limitations of claims 1, 2, 3, 4, 5, 6, 7, 9 and 71 as shown above and further teaches that a source electrode (30) formed at back side of the substrate (col.6 lines 45-48). However, Morikawa et al. does not explicitly teach that metal layer arranged at the bottom of via to form the source electrode.

It is conventional and also taught by Rumennik that metal is art recognized material for forming the backside source electrode. See Rumennik's Fig.1 and Fig.2.

It would have been obvious to one of ordinary skill in the art to form the metal layer as the backside source electrode as taught by Rumennik in order to have good connection (metal has a low resistivity) in the future connection with a package electrode. See Rumennik's col.4 lines 15-25.

Response to Arguments

5. Applicant's arguments filed 11-12-05 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of new founded reference US 5,693,563.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

7. Papers related to this application may be submitted to Technology center (TC) 2800 by facsimile transmission. Papers should be faxed to TC 2800 via the TC 2800 Fax center located in Crystal Plaza 4, room 4-C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The Group 2811 Fax Center number is (703) 872-9306. The Group 2811 Fax Center is to be used only for papers related to Group 2811 applications.

8. Any inquiry concerning this communication or any earlier communication from the Examiner should be directed to CUONG Q NGUYEN whose telephone number is

(571) 272-1661. The Examiner is in the Office generally between the hours of 6:30 AM to 5:00 PM (Eastern Standard Time) Monday through Thursday.

9. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor Eddie Lee who can be reached on (571) 272-1732.

Cuong Nguyen

Primary examiner

1/21/06